

Serial No.: 10/821,442
Amdt. dated 29 January 2007
Reply to Office Action of 27 September 2006

REMARKS

As noted above, the Applicant appreciates the Examiner's thorough examination of the subject application.

Claims 1-22 are pending in the subject application. In the final Office Action mailed 27 September 2006, the Examiner rejected claims 1-22 over certain prior art references under 35 U.S.C. § 103(a), as described in further detail below. Claims 1, 5, 6, 11, and 12 are amended herein. No new matter has been added. Applicant respectfully requests reconsideration and further examination of the subject application based on the foregoing amendments and the following remarks.

Claim Rejections – 35 U.S.C. § 103

Claims 6 and 8-12

In the Office Action, the Examiner rejected claims 6 and 8-12 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,622,501 to Levy ("Levy") in view of U.S. Patent No. 4,979,900 to Okamoto et al. ("Okamoto"). Applicant respectfully traverses the rejection and requests reconsideration for the following reasons.

One requirement for a rejection under 35 U.S.C. § 103(a) is that the cited reference(s) teach or suggest all of the limitations of the claims at issue. In this situation, this necessary requirements is not met as the combination of Levy and Okamoto fails to teach or suggest all of the limitations of claims 6 and 9-12 as amended. Accordingly, a *prima facie* case of obviousness necessary for a rejection under 35 U.S.C. § 103(a) has not been established, as explained below.

By the present amendment, independent claims 6 and 12 have been amended to include the generation of near infrared radiation in two specific wavelengths/ranges that are not appreciated by the cited references. As amended, independent claim 6 recites the following:

6. A process for treatment of the root canal of a human tooth, said process comprising:

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- (a) preliminary removal of bacteria and biofilm from the entire elongated space of said root canal;
- (b) debridement of said entire elongated space;
- (c) insertion of an elongated optical probe into said entire elongated space;
- (d) transmission of ~~low~~ near infrared radiation of two wavelength ranges including about 870 nm and 930 nm, respectively, longitudinally into the entire length of said optical probe and laterally through the surface of said elongated probe to the surface of said root canal defining said space, and through the dentinal tubules adjoining said root canal space;
- (e) said transmission being of sufficient energy density and sufficient time duration to thermolyze said biofilm and destroy remnants of said bacteria and in and adjacent to said root canal; and
- (g) obturation of said space with an apical seal.

In contrast, Levy is directed to methods of (and systems for) cutting mineralized physiologic tissue, including tooth enamel and dentin and bone, including: producing laser radiation at a wavelength which is absorbed more strongly by hydroxyapatite than by water; linearly polarizing the radiation and forming the radiation into a small diameter beam; and applying the polarized beam to a surface of tissue to be cut so that the beam has a selected angle of incidence relative to the surface; wherein the radiation is polarized and the beam is directed so that the radiation impinging on the surface has a polarization P parallel to the surface. *See, e.g.*, Levy, col. 1, line 60 through col. 2, line 5.

Levy fails to teach or suggest each any every limitation in the claims at issue, *e.g.*, “transmission of near infrared radiation of two wavelength ranges including about 870 nm and 930 nm, respectively,” as recited in amended claims 6 and 12. In particular, Levy fails to teach or appreciate the critical wavelengths including 870 nm and 930 nm, which as the subject

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disclosure explains "kill bacteria with a photodamage effect instead of a photothermal effect." *See, e.g.*, paragraph [0101].

In making the rejection, the Examiner stated that Levy was somewhat vague on the device's use for destroying bacteria in root canals, citing Okamoto as teaching use of a light conducting probe used for destroying bacteria in a patient's root canal with it being desirable to clean and prepare the root canal and then insert the probe into the prepared root canal where light is conducted at a sufficient energy to destroy bacteria.

In contrast with the Applicants' claims, Okamoto is directed to and teaches a method and apparatus that use bactericidal ultraviolet radiation to sterilize bacteria in a root canal. *See, e.g.*, Okamoto, col. 2, lines 1-8. As far a radiation source, Okamoto teaches (and claims) only the use of ultraviolet light, specifically describing ultraviolet light in the wavelength range of 200 nm to 300 nm. Thus, like Levy, Okamoto fails to teach or suggest each any every limitation in the claims at issue, *e.g.*, "transmission of near infrared radiation of two wavelength ranges including about 870 nm and 930 nm, respectively." as recited in amended claim 6.

Consequently, the combination of the teachings of Levy and Okamoto, whether the references are considered alone or in combination, fails to teach or suggest all of the limitations of claims 6 and 9-12 as amended. Thus, the combination of Levy and Okamoto is an improper basis for a rejection of claims 6 and 9-12 under 35 U.S.C. § 103(a), and the rejection should be withdrawn, accordingly.

Claims 1-5, 7 and 12-22

Claims 1-5, 7 and 12-22 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Levy in view of Okamoto, as applied to claims 6 and 9-12, and further in view of U.S. Patent No. 5,374,266 to Kataoka et al. ("Kataoka"), U.S. Patent No. Nakajima et al. U.S. 5,300, 067 ("Nakajima"), and U.S. Patent No. 5,741,247 to Rizoiu et al. ("Rizoiu"). Applicant respectfully traverses the rejections and requests reconsideration for the following reasons.

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Amended claim 1, representative of the independent claims under the rejection, recites the following:

1. A system for the thermolytic eradication of microorganisms and biofilm in the root canal of a human tooth, said system comprising an elongated and flexible optical probe, a laser oscillator communicating with the distal end of said optical probe through at least one optical fiber, a power supply operatively connected to said laser oscillator, and a control operatively connected to said power supply and said laser oscillator;

(a) said optical probe being composed of a member of the class consisting of sapphire and zirconium, and having an optically diffusive surface dispersing optical energy throughout 360° laterally of said optical probe and along the entire length of said optical probe;

(b) said optical fiber ranging in diameter between 400 to 1000 µm;

(c) said optical probe ranging in diameter from ISO 20 to ISO 70;

(d) said laser oscillator generating radiation two near infrared wavelength ranges including about 870 nm and 930 nm, respectively;

(e) said optical fiber being operatively connected between said laser oscillator and an ingress at the proximal end of said optical probe;

(f) said optical probe being sufficiently long for insertion into substantially the entire length of the root canal of said tooth;

(g) said optical probe causing lateral dispersion of said radiation from said probe throughout said root canal;

(h) said control energizing said laser oscillator for dispersion of said radiation at an energy density and for a period of time sufficient to thermolyze said microorganisms and said biofilm in said root canal.

[Emphasis added]

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The Levy and Okamoto references have been described previously concerning the rejection of claims 6 and 9-12 under 35 U.S.C. § 103(a). Similar to that rejection, the combination of the teachings of Levy and Okamoto cited for the instant rejection fails to disclose or suggest each and every limitation as arranged in Applicants' claims 1-5, 7, and 12-22, *e.g.*, including "said laser oscillator generating radiation two near infrared wavelength ranges including about 870 nm and 930 nm, respectively."

Also in contrast with the Applicant's claims, Kataoka is directed to medical laser devices utilizing a hand piece that includes a delivery fiber optic receiving radiation from a laser source and a probe separated from the delivery fiber optic by an airtight configuration. The probe includes at least two independent air passages and at least one water supply passage. The emission end of the fiber optic and incident end of the probe are cooled by air while water is supplied to the leading end of the probe. *See, e.g.*, Kataoka, col. 4, lines 49-68. Nakajima further contrasts with Applicant's claims by being directed to and teaching a laser device with probe and cooling features similar to Kataoka (it is noted that the references share a common priority document). *See, e.g.*, Nakajima, col. 2, line 64 through col. 3, line 12. Further contrasting with the Applicant's claims, Rizoiu is directed to and teaches a cutting apparatus that relies on use of atomized fluid particles and includes an atomizer for placing atomized fluid particles into an interaction zone used in conjunction with an electromagnetic energy source for focusing electromagnetic energy in the interaction zone. *See, e.g.*, Rizoiu, col. 3, lines 28-47.

Kataoka, Nakajima, and Rizoiu, whether the references are considered alone or in combination, fail to cure the deficiencies noted Levy and Okamoto, *e.g.*, by failing to teach or suggest "said laser oscillator generating radiation two near infrared wavelength ranges including about 870 nm and 930 nm, respectively," as recited in amended claim 1.

None of the references cited for the rejection teach or suggest the use of laser oscillators producing the specific NIR wavelengths of 870 nm and 930 nm as recited in amended claims 1 and 12. Further, none of these cited references appreciate the criticality of the NIR wavelengths

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of 870 nm and 930 nm to cause photodamage in bacteria, as described by the subject application (*see, e.g.*, paragraph [0101]) and as recited in amended claims 1 and 12.

Consequently, the combination of the teachings of Levy, Okamoto, Kataoka, Nakajima, and Rizoiu (whether the references are considered alone, in any combination, or in any sub-combination) fails to teach or suggest each and every limitation of claims 1-5, 7 and 12-22. For at least these reasons, the cited combination of the Levy, Okamoto, Kataoka, Nakajima, and Rizoiu references forms an improper basis for a rejection of claims 1-5, 7 and 12-22 under U.S.C. § 103(a). Applicant requests that the rejection of these claims be withdrawn, accordingly.

Conclusion

In view of the remarks submitted herein, Applicant respectfully submits that all of the claims now pending in the subject application are in condition for allowance, and respectfully requests a Notice of Allowance for the application.

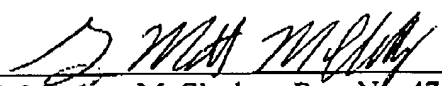
Authorization is hereby given to charge the fee for a one-month extension of time under 37 C.F.R. § 1.136, the fee for a Request for Continued Examination (RCE) under 37 CFR § 1.114, and any other required fees and/or to credit any overpayments to deposit account No. 50-1133.

If the Examiner believes there are any outstanding issues to be resolved with respect to the above-identified application, the Examiner is invited to telephone the undersigned at his earliest convenience so that such issues may be resolved telephonically.

Respectfully submitted,

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